SIEMENS

SIREMOBIL Compact

SP

System Manual

Service Instructions

Serial numbers 01417 01999

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Register 5
Print No.: RXR2-130.061.02.03.02
Replaces: RXR2-130.061.02.02.02

English
Doc. Gen. Date: 10.03

Chapter	Page	Revision
all	all	03

Document revision level

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Required documents

- SIREMOBIL Compact circuit diagram, G5429
- Circuit diagram for monitor X2080 or X2183
- SIREMOBIL Compact log book
- For the laser targeting device where used:
  Adjustment Instructions / Laser targeting device RXR2-130.032.01...

Required tools, measurement and auxiliary devices

NOTE

All tools, measurement and auxiliary devices with the exception of those marked "*" are listed along with their specifications in the STC (Service Tools Catalog).

- DMM — e.g. "Fluke 8060 A", Part No. 97 02 101 Y4290
- Oscilloscope > 50 MHz — e.g. Tektronix 2232, Part No. 97 02 234 Y3155
- Dose measurement device — e.g. PTW-DALI (no longer in ARTD)
  or PTW-NOMEX, Part No. 97 08 637 Y0388
  or PTW-DIADOS, Part No. 97 17 612 Y0388
- Protective conductor meter — e.g. Safety meter, Part No. 44 15 899 RV090
  or Bender safety meter, Part No. 97 06 979 Y0526
- Service PC with WINDOWS 3.1 or 3.11 operating system*
- Service software (refer to SIREMOBIL Compact log book)*
- Connection cable, Service PC - SIREMOBIL Compact (e.g. Part No. 99 00 440 RE999)
- 1 set of resolution tests — e.g. Part No. 28 71 820 RE999
- 1 set of radiation filters — e.g. Part No. 97 98 596 G5321
- Center cross — e.g. Part No. 96 60 051 RE999
- Special purpose oil (Optimol GmbH, Viscogen KL 300, 40g) Part No. 73 95 353 RH090
- Heat conducting paste WPS — e.g. Part No. 20 48 650 SRN 6400
- Sealing compound — Part No. 20 49 716 SRN 6002
- Tool kit*
- 1 set Allen keys*
- 200 N spring scale — e.g. Part No. 44 15 113 RH090
- Torque wrench 20 Nm to 100 Nm — e.g. Part No. 80 86 159 RE999

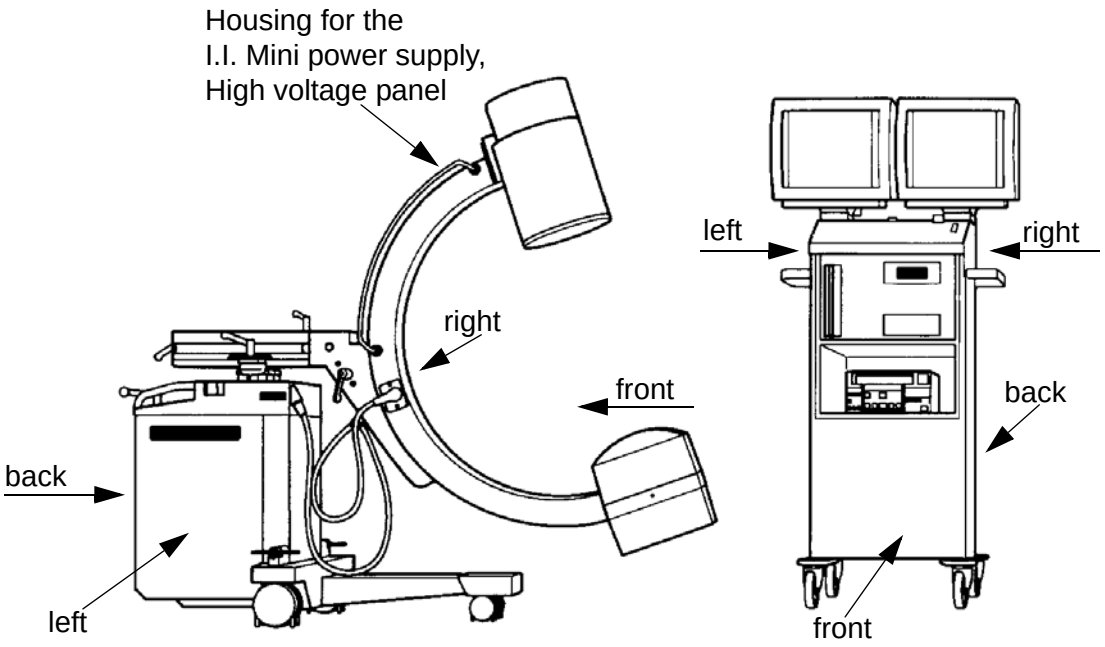

Fig. 1

Information regarding this document

These service instructions will assist you in adjusting the SIREMOBIL Compact for routine operation. Not every adjustment is required each time the system is serviced.

Position labels

The labels used in these instructions (left, right, front and back) are explained in Fig.1.

Safety information

⚠WARNING

Risk of physical injury or death and damage to property!
Observe

- **the product-specific safety information in these instructions,**
- **the general safety information in the instructions TD00-000.860.01... and**
- **the general safety information according to ARTD Part 2.**

Noncompliance can lead to death, physical injury or damage to property.

⚠WARNING

Electrical voltage!
Noncompliance can lead to death, physical injury or damage to property.

After the system covers are removed, live parts are exposed. To prevent danger, the system must be disconnected from the line voltage before removing its covers. To do this, disconnect the system power plug or switch its power supply off and secure the power switch against accidental reactivation.
Any service required in connection with electrical voltage should be performed in accordance with general service information TD00-000.860.01... .

⚠WARNING

Electrical voltage!
Noncompliance can lead to death, physical injury or damage to property.

After servicing the primary circuit of the ON/OFF assembly (e.g. replacing the ON/OFF assembly or any of its components), you must measure and record the equivalent leakage current (see system manual or logbook).

⚠WARNING

Danger of infection with pathogens!
In the case of noncompliance death or physical injury can arise.

This product is released for operation in operating rooms and can be contaminated with infectious blood or other body secretions. Avoid all contact with blood or other body secretions!
Comply strictly with the preventive measures against infectious diseases specified in ARTD-002.731.37...!

⚠WARNING

Electrical voltage!
Noncompliance can lead to death, physical injury or damage to property.

After completing all service work and attaching all system covers, you must perform a protective ground wire test according to ARTD-002.731.17... .
The protective ground wire resistance must not exceed 0.2 ohms.

⚠WARNING

X-ray radiation!
Noncompliance can lead to death or physical injury.

When performing service work involving the emission of X-ray radiation, you must observe the radiation protection regulations. The radiation activity must be kept as low as possible (low kV and mA levels, short radiation time).
Keep as far away from the radiation source as possible.
Radiation protection devices (lead partitions, etc.) and radiation-protection clothing (lead apron) must be used.

⚠WARNING

Risk of physical injury and damage to property!

When performing service work on the horizontal slide of the basic unit (for example, when performing repair work on the brake of the C-arm horizontal travel) it is possible that the C-arm may slide out of its position and drop onto the floor after the end stop has been removed.
Before dismantling the end stop, the horizontal travel brake must be locked and the horizontal slide must be mechanically locked to prevent it from sliding out. For example, the basic unit can be positioned in the room in such a way that the C-arm mechanically touches one of the walls.

⚠CAUTION

Risk of being burned by hot parts or components!
Noncompliance can lead to light or medium burns, especially of the hands.

Once the covers have been removed, parts or components (e.g. power components, heat sinks, solenoid brakes) become exposed which may exhibit temperatures of up to 50°C in operation. To prevent burns, switch off the system power supply and let the system cool off for at least 5 minutes before resuming work.

⚠CAUTION

Electrical voltage!
Noncompliance may cause damage to property.

ESD protection guidelines must be observed when servicing.

Measuring the equivalent device leakage current

Regulations and scope for the subsidiaries

Within the scope of DIN VDE0751 part l 1, the equivalent device leakage current test must be performed. Outside the scope of DIN VDE0751, the subsidiaries must observe the following: refer to ARTD-002.731.17, Safety rules for installation and maintenance. The legal national regulations apply to the subsidiaries. If no regulations exist, observe the following rules in the interest of safety for customers, patients, employees, other persons, and the company.

Initial measurement

The measurement was performed at the factory and the value measured was recorded in test protocol 1b. The measurement was performed with the line voltage and line frequency specified in the test protocol. During startup of the SIREMOBIL Compact on-site, the values were checked, remeasured and recorded to determine whether they deviate from the line voltage. The protocol is filed in Register 3 of the log book.

Repeat measurements

When performing service or repair work in the primary circuit of the power supply, the equivalent device leakage current must be measured again and compared with the initial value measured. The measurement setup must match the measurement setup for the equivalent leakage current / protocol. During measurement, the SIREMOBIL Compact must be switched on. When using the Bender safety tester, the tester must be set to manual measurement. The values measured during repeat tests may not exceed the original value by more than 50%. In addition, the limit of 2 mA cannot be exceeded. SIREMOBIL Compact systems which exceed this threshold must be serviced. The values measured are to be recorded in the equivalent device leakage current / protocol (refer to log book, Register 3).

Covers

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Disconnect the line voltage plug prior to removing covers.

Basic system

Back cover

Removing the back cover

- Put on the foot brake.
- Remove the screws from the back cover.
- Pull the cover back approx. 25 cm.
- Unscrew the protective conductor from the cover.
- Pull the cover completely off and tilt it downward.
- Lift up the cover and raise both lateral metal brackets from the guide rails.

Installing the back cover

- Fit the lateral metal brackets back into the guide rail.
- Remount the protective conductor to the back cover.
- Lift the cover and push it forward. Be careful with the EMC spring contact.
- Replace the cover and tighten the screws.

Monitor trolley

Removing the covers

- Remove the upper back cover plate of the log book compartment.
- Remove the protective conductor.
- Remove the lateral Allen screws from the lower back cover.
- Remove the protective conductor from the cover.

Installing the covers

- Begin with the lower back cover.
- Remount the protective conductor for the lower cover.
- Mount the cover and tighten the screws.
- Remount the protective conductor.
- Install the cover and tighten the screws.

I.I. cover

- The cover for the image intensifier is secured by one screw.
- Insert the rubber lip in the groove prior to remounting the cover.
- When installing or deinstalling, handle the protective conductors with care.

I.I. mini power supply

- The control panel of the image intensifier mini voltage supply is accessible after removing the I.I. cover.
- The high voltage panel of the I.I. mini power supply is built in to the C-arm (see Fig. 1).
- The cover (on the outside of the C-arm near the I.I.) is secured with two screws and can be removed from the rubber buffer of the I.I. After removing the cover, the high voltage panel is accessible.

SIREPHOS cover

NOTE	**The SIREPHOS cover has been sealed all around against contamination by dirt using a sealing compound (Part No. 20 49 716).**

- Loosen the cover screws of the SIREPHOS cover.
- Use a sharp knife to cut open the sealing compound all around the cover.
- Lift off the SIREPHOS cover.
- Remove the sealing compound residue from the cover and from the SIREPHOS.
- On completing service, place the SIREPHOS cover on the SIREPHOS and seal it with sealing compound all around.
- Use a paper towel to wipe off excess sealing compound.
- Refasten the SIREPHOS cover with the cover screws.

Back stop plate at the C-arm horizontal support

⚠WARNING

Risk of physical injury and damage to property!

When performing service work on the horizontal slide of the basic unit (for example, when performing repair work on the brake of the C-arm horizontal travel) it is possible that the C-arm may slide out of its position and drop onto the floor after the end stop has been removed.
Before dismantling the end stop, the horizontal travel brake must be locked and the horizontal slide must be mechanically locked to prevent it from sliding out. For example, the basic unit can be positioned in the room in such a way that the C-arm mechanically touches one of the walls.

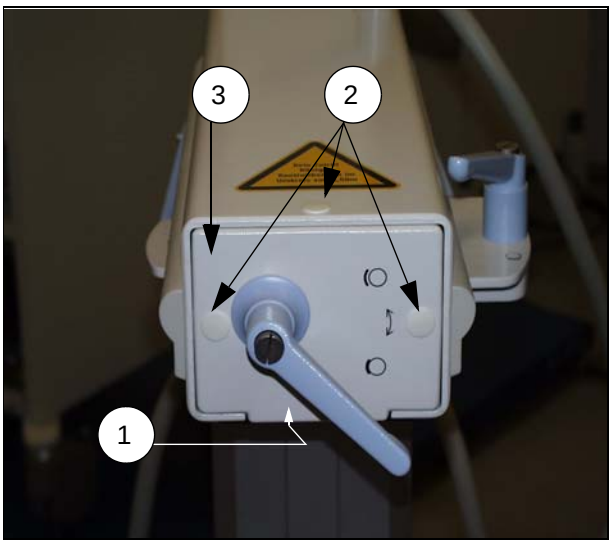

Fig. 2

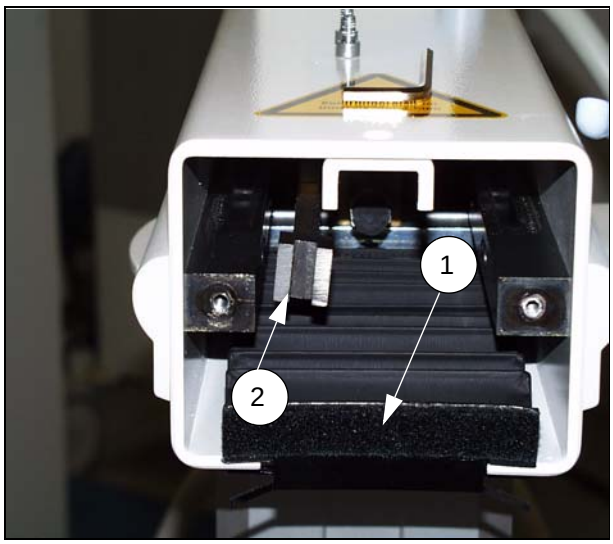

Fig. 3

For work that requires removal of the end stop (see 3/Fig. 2), observe the warning above.

Removing the back stop plate

- Lock the horizontal brake
- Remove the rubber cover (adhesive closure) underneath the horizontal support (see 1/Fig 2 and 1/Fig.3)
- Remove the caps (2/Fig.2)
- Remove the three screws (2/Fig.2)
- Remove the back stop plate (3/Fig.2). Pay attention to the coupling part set on the shaft of the handle mechanism (2/Fig. 3).

Installing the back stop plate

- Place the coupling part (2/Fig.2) back on the shaft.
- Remount the back stop plate (3/Fig.1) and fasten it with the screws.
- Reinstall the rubber cover (1/Fig.1) and close it (adhesive closure).
- Check the function of the horizontal brake.

Concluding steps

- **After completing all work, perform the protective conductor test (see ARTD-002.731.17).**

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⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Disconnect the SIREMOBIL Compact line voltage plug.

- Open the back cover of the monitor trolley.
- Measure the on-site line voltage and line frequency.
- Adjust transformer T1 to the required line voltage and line frequency. Refer to the label on the switch-on assembly.
- Adjust transformer T2 to the required line voltage and line frequency. Refer to the label on the switch-on assembly.
- Check fuses F1 and F2 to see if they correspond with the values on the label of the switch-on assembly and replace them, if necessary.
- Mark the correct line voltage and line frequency on the line voltage label at the back of the monitor trolley.

Checking the line voltage on the monitor trolley

- Connector X10 for the basic system must be disconnected.
- The monitor, memory device and other devices, if present, such as multiformat camera, video printer or video recorder must be disconnected from the line voltage supply.
- Check the secondary voltages for line voltage transformer T1 according to Table 1.

	from test point	to test point	Voltage	Comment
	Transformer T1.31	Transformer T1.32	190 V ~ to 205 V ~	cannot be adjusted
	Transformer T1.31	Transformer T1.33	230 V ~ to 246 V ~	cannot be adjusted
	Line voltage cable Memoskop, N	Line voltage cable Memoskop, L	230 V ~ to 246 V ~	cannot be adjusted
	Line voltage cable Monitor 1, N	Line voltage cable Monitor 1, L	230 V ~ to 246 V ~	cannot be adjusted
Option:	Line voltage cable Monitor 2, N	Line voltage cable Monitor 2, L	230 V ~ to 246 V ~	cannot be adjusted
Option:	Line voltage cable Multispot, N	Line voltage cable Multispot, L	230 V ~ to 246 V ~	cannot be adjusted
Option:	Line voltage cable Video printer, N	Line voltage cable Video printer, L	230 V ~ to 246 V ~	cannot be adjusted
Option:	Line voltage cable Video recorder, N	Line voltage cable Video recorder, L	230 V ~ to 246 V ~	cannot be adjusted
Option:	Optical isolation line voltage cable, N	Optical isolation line L voltage cable	230 V ~ to 246 V ~	cannot be adjusted

Tab. 1

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Low voltages

Check the operating voltages for the SIREMOBIL Compact against the values in Table 1.

from test point	to test point	Voltage	Tolerance	Potentiometer
M14.4 (0V)	M14.5/6 (+5V)	+ 5 V	+/- 0.2 V	M14. +5V/Adj.
M14.3 (0V)	M14.2 (+15V)	+ 15 V	+/- 0.1 V	M14. +15V/Adj.
M14.3 (0V)	M14.1 (-15V)	- 15 V	+/- 0.5 V	M14. -15V/Adj.
D3.X8.1 (0V)	D3.X8.3 (+26,75V)	+26.75V	+/- 0.25 V	D3.R3
M13.S- (0V)	M13.S+ (+13V)	+13V	+/- 0.2 V	M13.TR1
D3.X1.7 (0V)	D3.X1.9 (+24V)	+ 26.5 V to + 29.5 V	n.a.	not adjustable

Tab. 1

I.I. voltages

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Do not touch any part of the I.I. mini power supply!

The voltages E1 / E2 / E3 and A may be taken from the I.I. test protocol and checked or adjusted against the control test points listed in Table 2.

Voltage	Test point	Ground point (0V)	Potentiometer for full format	Potentiometer for zoom format	Voltage divider ratio
E1	UE1	⊥	P10	P11	1:1
E2	UE2	⊥	P6	P7	1:1
E3	UI 15	⊥	P2	P3	1:10000
30kV, Anode	UI 30	⊥	P1	P1	1:10000

Tab. 2

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Control board D1, Host

- Connect the service PC to the serial service interface on SIREMOBIL Compact.
- Start the service program.
- Insert the "Parameter" diskette in drive A.
- Select the Download menu and start the download (ARC / Fil. / Host).
- After the download has successfully been completed (1 minute), wait for the system to boot.
- The SIREMOBIL Compact is operational.

NOTE

If you cannot run download (e.g. power failure during download):
- Switch the SIREMOBIL Compact off and back on
- Restart download

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Generator, kV offset adjustment

NOTE

The kV offset adjustment has to be followed by the generator adjustment (filament circuit learning program).
Always perform the kV offset adjustment prior to beginning the generator adjustment.

- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Diagnostic menu.
- Select the Monitoring menu.
- In the "Group 1“ Combo box, select "KV offset adjustment".

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

- Click on "Update Start".
- After the "Start fluoro" message in the ACTIONS line, press the radiation release button on the SIREMOBIL Compact hand switch.

NOTE

After the "KV error break" message in the STATUS line, click on "Update Stop". Wait for approx. 10 seconds. Click on "Update Start" again. After the "Start fluoro" message in the ACTIONS line, press the radiation release button on the SIREMOBIL Compact hand switch. Refer to the text which follows for additional procedures.

- Continue to hold the radiation release button as long as the message "Continue fluoro" is displayed in the ACTIONS line.
- Release the radiation release button as soon as the message "Stop monitoring" appears in the ACTIONS line .
- Click on "Update Stop".
- Perform the generator adjustment (filament circuit learning program).

Generator adjustment (filament circuit learning program)

NOTE

The kV offset adjustment must always be performed prior to starting the generator adjustment.

NOTE

If an error occurs during the generator adjustment, switch OFF the SIREMOBIL Compact and perform the kV offset and generator adjustments again.

NOTE

As soon as the generator adjustment is started, press the radiation release button on the hand switch until the "Stop monitoring" message appears in the ACTIONS line. If you deactivate radiation too soon, the generator adjustment must be completely repeated. Exception: You can briefly stop pressing the radiation release button (less than 30 seconds) during the warmup phase (warmup displays in the STATUS line on the service PC) of the SIREPHOS. The generator adjustment continues when the radiation release button is pressed again.

- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Diagnostic menu.
- Select the Monitoring menu.
- In the "Group 1“ Combo box, select "Generator adjustment".
- Click on "Update Start".

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

- After the "Start fluoro" message in the ACTIONS line, press the radiation release button on the SIREMOBIL Compact hand switch.
- Continue to hold the radiation release button as long as the message "Continue fluoro" is displayed in the ACTIONS line.
- "Warmup" appears in the STATUS line, the Sirephos is warming up. After approx. 8 minutes, the message "learning pushfactor" will appear in the STATUS line.
- A maximum of 15 exposures will automatically be released.
- The message "Learning done" appears in the STATUS line after the generator adjustment has been successfully completed.
- The "Stop monitoring" message appears in the ACTIONS line.
- Stop radiation.
- Click on "Update Stop".
- Switch the SIREMOBIL Compact OFF and back ON again.

Checking the generator adjustment

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

- With the system on, connect the service PC to the SIREMOBIL Compact.
- Select "Test..." in the Diagnostic menu.
- Select cassette simulation in "Function Groups".
- Select cassette switch ON in "Available Functions".
  The SIREMOBIL Compact is now in direct exposure mode.
- Select 81 kV with the kV+ / kV- keys.
- Select 8 mAs with the mAs+ / mAs- keys.
- Connect oscilloscope channel 1 to D1.X46, ground at 0V. Set the sensitivity to 1V /Div.
- Connect oscilloscope channel 2 to D1.X48, ground at 0 V. Set the sensitivity to 2.5V/ Div.
- Set the time to 25 ms / Div.
- Set the oscilloscope to storage mode.

- Release an exposure with the hand switch and store the oscillogram with the exposure.
- Evaluate the stored oscillograms.
  The tube current must reach the tolerance range of 13 mA +/- 1.5 mA in the time of 3 ms and may not leave this range for the next 6 ms.
  (The tube current may not run above 14.5 mA within the first 6 ms).
- Refer also to oscillograms in Fig. 1 / Fig. 1a and Fig. 1b.
- Select "Cassette switch off" on the service PC in "Available Functions".
  Direct exposure mode is cancelled.
- If the unit exceeds the tolerance range, the generator adjustment must be repeated.

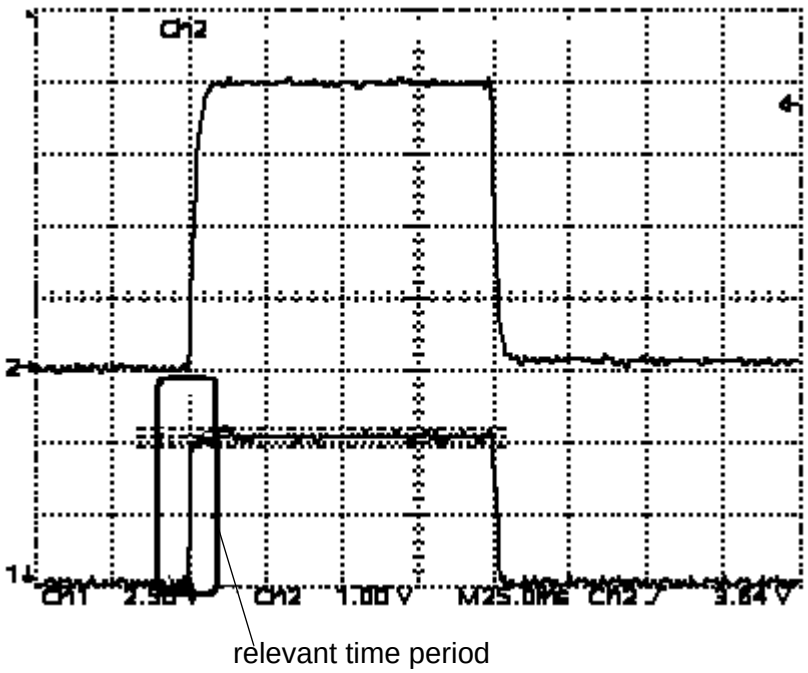

Fig. 1

Error examples:

Tube current exceeds the upper limit
- preset filament current too high

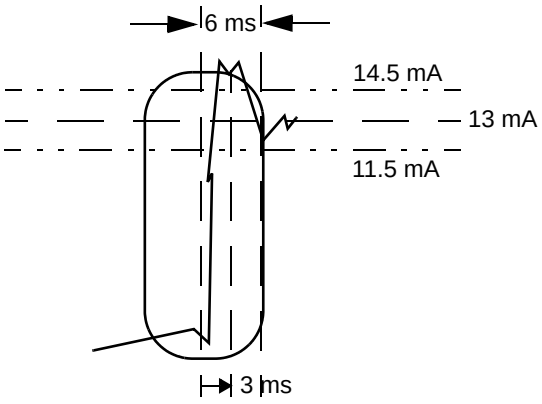

Fig. 1a

Tube current exceeds the lower limit
- preset filament current too low

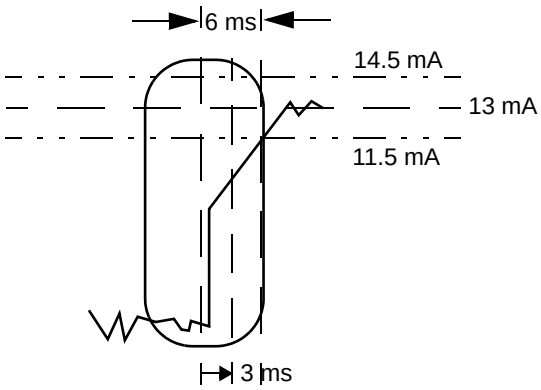

Fig. 1b

Dose rate adjustment

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

Prerequisite

- The "Adjustment mode" parameter in the "Dose rate adjustment" parameter group must be programmed to "Semi automatic".

Preparations

- Switch the SIREMOBIL Compact on.
- Connect the service PC to the serial interface of the SIREMOBIL Compact.
- Start the service program.
- Select the “Diagnostics...”menu.
- Select the “Dose rate adjustment” menu in the Combo Box “Group 1”.
  - The subsequent display is visible on the service PC:

- AUTO REGULATION	indicates the current status of the automatic adjustment (active / not active / done)
- BRIGHTNESS DEVIATION	indicates the difference of the brightness actual value minus the brightness nominal value
- CONTROL CURVE	indicates the currently selected fluoroscopic curve
- ADJUSTMENT	Indicates the operating control mode (Generator / Camera Iris / Stop)
- BV-ZOOM STATUS	indicates the I.I. format (survey / zoom).
- DOSERATE	indicates the selected dose control level (LOW / MID / HIGH) Only the MID dose control level is used

- Insert 25mm AL and 2.1mm Cu filters at the radiation exit port of the Sirephos.
- The grid remains on the I.I.

Correction factors:

Grid factor 23cm (9”) I.I. and 17cm (7”) I.I.:	1.5
Chamber correction factor for Dali and Nomex:	1.06

Dose rate to be set at the I.I. input screen:

23 (9”) I.I. and 17cm (7”) I.I.:	220 nGy/s

Adjustment

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

- Select the I.I. survey format.
- Center the dose measurement chamber on the I.I. input screen.
- Select “Dose rate adjustment” on the service PC.
- Click on “Update Start”.
  The following operating modes will be automatically selected:
  - kV/mA curve S2 (Antiisowatt 5mA)
  - Manual kV fine adjustment (to increase the accuracy of adjustment)

- Release fluoro.
- Activate dose rate control.
- Switch fluoro off.
- Select KV stop.
- Install the dose measurement chamber on the I.I. input.

- Release fluoro.
- Using the KV+ and KV- keys, set the dose rate to 330 nGy/s +/- 5% (Dose rate* grid factor). This should produce a kV value of from 70 kV to 80 kV. If necessary, switch off fluoro and change the prefiltration. After changing the prefiltration, set the dose rate again.
- Switch fluoro off.
- Remove the dose measurement chamber from the I.I. input.

- Switch fluoro on.
- Press the >0< key on the operating console of the SIREMOBIL Compact. This starts the automatic adjustment of the TV-Iris collimator.
- Wait until the message "done" is displayed in the "AUTO REGULATION" line (Service PC). The new TV-Iris position values will be stored in the Host RAM.
- The "BRIGHTNESS DEVIATION" value will be displayed in the "BRIGHTNESS DEVIATION" line and should not deviate by more than +/- 3.
- Switch fluoro off.
- Click on "Update Stop" on the service PC and wait until the "CAL" message disappears on the 7-segment display to the right. This stores the TV-Iris position value in the Host EEPPROM.
- Close the "Monitoring" window on the service PC by clicking on the "cancel" button.

Checking the dose rate in automatic mode

NOTE

The dose rate should be checked for the kV/mA curves plateau 3mA and 5mA. If other kV/mA curves have been programmed on the system at the customer's request, temporarily program the HC1 and HC2 curves. After running the check, reprogram the customer-specific kV/mA curves. To change the kV/mA curves, refer to the file Moreinfo.hlp, Parameter overview, Control curve selection (Fl/Pfl).

- Center the dose measurement chamber again on the I.I. input screen.

- Adjust the prefiltration for the KV/mA curve you are using, so that in automatic mode the kV values are between 70kV and 80 kV.

- Check the dose rate in automatic mode (kV Stop not selected).

  ➪ The dose rate should be 350nGy/s +/- 15%.
  (Dose rate* grid factor * chamber correction factor)

Final steps

- Switch back to the main menu with ESC on the service PC.
- Select the menu "Data, Backup...".
- Click on "Parameter" in the backup window.
- Then click on "Backup".
- Enter the text "dose rate set" under "Remarks for Parameter".
- Afterward, click "OK". The parameters will be saved to the diskette.
- Exit the service program.

Setting the maximum skin dose rate

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

NOTE

Setting the maximum skin dose rate is necessary only for countries where DHHS regulations apply.

Prerequisites

- You must program one of the FL curves S2, HC2 or IODINE.
- The FL curves S2, HC2 or IODINE should be used for the following adjustment.
- The X-ray tube cover must be installed.
- Use the dose ionization chamber of the dose measurement device to measure dose rates greater than 10R/min.
- If the area dose product measurement device is used, the dose measurement chamber must be mounted above the radiation exit port of the Sirephos.

Preparations

- Attach the dose ionization chamber at a distance of 30 cm from the I.I. housing (Fig. 3).
- Select one of the FL curves S2 / HC2 or IODINE according to the programming. (Push-key)
- Briefly release fluoro.
- Select kV stop mode and enter 110kV (5mA)

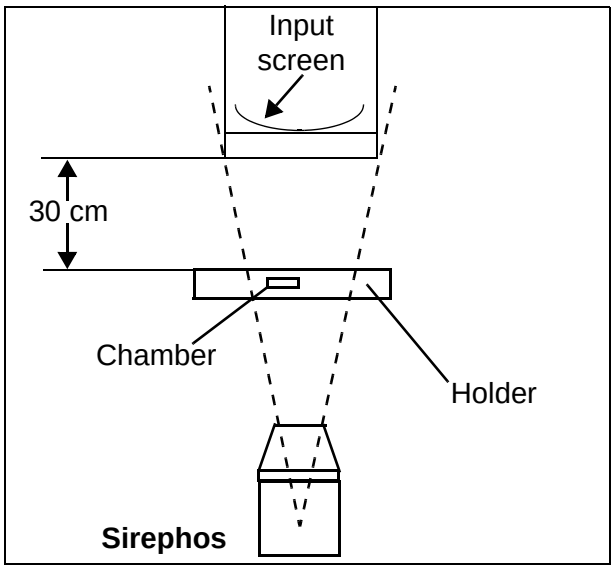

Fig. 2

NOTE

If the maximum tube current was already reduced, the mA value displayed at 110kV should be recorded and used for the calculation. The maximum skin dose rate to be set should equal 9R/min.

Measurement

- Switch on fluoroscopy.
- Read and record the value displayed on the dose rate meter.
- If the value measured exceeds 9R/min, the maximum tube current must be reduced. If the value measured is less than 9R/min, the tube current does not need to be reduced.
- Switch fluoroscopy off.
- Calculate the maximum tube current.

$$\frac{\text{tube current displayed at 110kV in mA} * 9\ \text{R/min}}{\text{measured dose rate value in R/min}} = \text{tube current to be programmed in mA}$$

- Multiply the tube current to be programmed by 10, since entry on the service PC must be made in 1/10mA. Round off the value to the nearest whole number.

Example: Tube current displayed at 110kV: 5mA
Maximum skin dose rate: 9R/min
Measured dose rate value : 10.2 R/min.

$$\frac{5\ (\text{mA}) * 9\ (\text{R/min})}{10.2\ (\text{R/min})} = 4.41\ (\text{mA})$$

Rounded to the nearest whole number: 44

The value to be programmed is 44.

Programming

- Connect the service PC to the serial interface of board D1.
- Select the Adjustment, Parameters menu.
- In the Combo box "Parameter Groups", select "Limitation of skin dose rate (FL)" .
- Click on "Get from unit" .
- Enter the value to be programmed in "Value" .
- Click on "Set Value".
- Select "Put to unit" . Read the menu guide on the service PC.
- Select "Save to file".
- The value to be programmed has been transferred to the SIREMOBIL Compact and temporarily stored to the disk.

NOTE	**You must exit the service program with "Logoff" and "Quit". Only then will the modified parameters be stored on the floppy disk as a new file.**

Checking

- After programming, check the maximum skin dose rate again.

Collimator, X-Iris

NOTE	**Because of the mechanical hysteresis of the semi-transparent slot diaphragm, open the collimator blades to maximum aperture, prior to adjusting the radiation iris.**

⚠WARNING	**X-ray radiation!** **See Chapter 1, Safety Information.** **Protect yourself against radiation exposure. Wear a lead apron.**

- Attach the center cross in the center of the image intensifier input screen.
- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Adjustment, Calibrations menu.
- Answer the query with "yes".
- Select "X-Iris" in the "Function Groups" combo box.
- In the "Available Functions:" window select "1. Init (Limits Off / Autosearch)" and click on Execute.
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit," click "No".
- The X-Iris can now be completely opened and closed with the X-Iris keys.
- Select I.I. survey format.

- During fluoroscopy, adjust the X-Iris by opening and closing the X-Iris keys so that the collimator blades are still visible along the edge of the I.I.
- Stop fluoroscopy.
- Select "2. II. - Full Format Position" on the service PC and click on "Execute" .
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit," click "No".
- Switch to zoom format.

- During fluoroscopy, adjust the X-Iris by opening and closing the X-Iris keys so that the collimator blades are still visible along the edge of the I.I.
- Stop fluoroscopy.
- Select "3. II. - Zoom Format Position" on the service PC and click on "Execute" .
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit," click "No".
- Open the X-Iris completely.
- Select "4. CEX Position" on the service PC and click on "Execute" .
- For the query "Do you want to reset the unit", click "No" .
- Close the X-Iris completely.

- Release fluoroscopy. The X-Iris must close between 4 - 4.5 cm.
- Stop fluoroscopy.
- Select "5. CLOSED POSITION" on the service PC and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit," click "No".
- Select "8. Init Off & Store Positions" on the service PC and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit," click "Yes".
- Switch the SIREMOBIL Compact OFF and ON again.

- Check the X-Iris again in survey format and zoom format. The collimator blades must still be visible on the edge of the image. If necessary, repeat the adjustment.
- Stop fluoroscopy.
- Return to the main menu on the service PC with the ESC key.
- Select the Data, Backup... menu.
- Select Parameter in the backup window.
- Click on "Backup".
- At "Remarks for Parameter" enter "X-Iris set“.
- Click on "OK". The new position values for the collimator will be stored on the disk.
- Return to the main menu with the ESC key.

Camera rotation

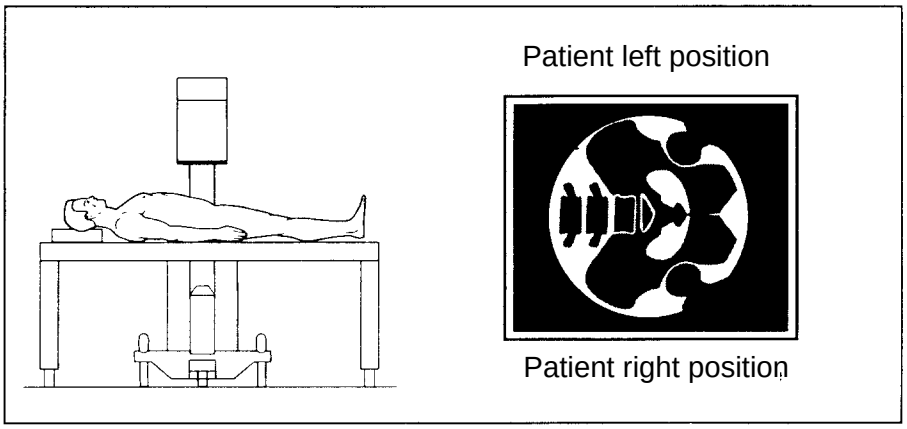

Fig. 3

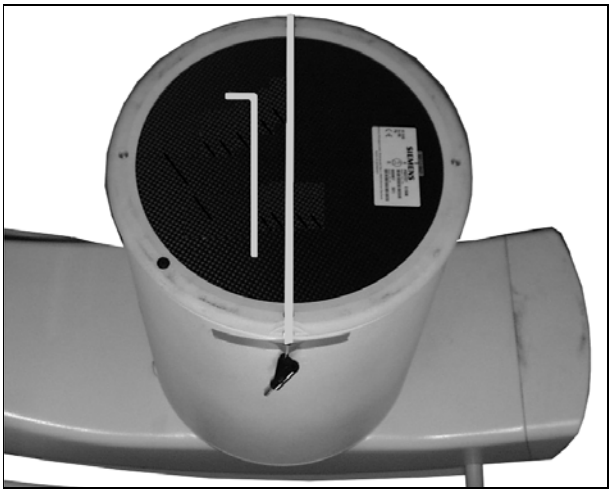

Fig. 4

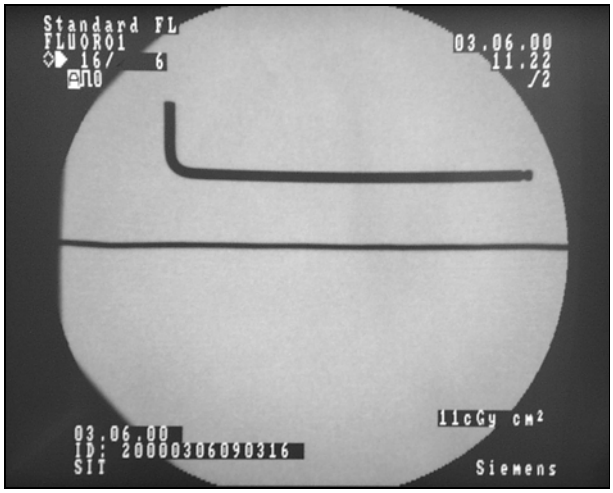

Fig. 5

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

NOTE

The keys for horizontal and vertical image reversal must be off prior to adjusting camera rotation. Camera rotation should be set in the 0° position.

Fig. 3, 4 and 5 show the 0° position.

NOTE

With the right camera rotation key (the arrow on the key is pointing clockwise), the marker on the monitor will rotate clockwise. The image contents will rotate counterclockwise.

With the left camera rotation key (the arrow on the key is pointing counterclockwise), the marker superimposed on the monitor will rotate counterclockwise. The image contents will rotate clockwise.

- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Adjustment, Calibrations menu.
- Answer the query "yes".
- In the Combo box "Function Groups:" select "Camera Rotation" .
- In the window "Available Functions:" select "1. Init (Disable Limits)" and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit", click "No".
- Attach the center cross, or other fluoroscopic image positioning element to the image intensifier.

- Start fluoro and rotate the camera to the +180° position
  (With the camera rotation key clockwise).
  The image contents should rotate counterclockwise.
- Stop fluoro, in the window "Available Functions:", select "2. +180 Degree Position" and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit", click "No".

- Start fluoro and set camera rotation to the 0° position.
  The image (left/right / up/down) corresponds to Fig. 4
- Stop fluoro, in the window "Available Functions:", select "3. 0 Degree Position" and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit", click "No".

- Start fluoro and rotate the camera to the -180° position (with the counterclockwise camera rotation key). The image contents will rotate clockwise.
- Stop fluoro, in the window "Available Functions:", select "4. -180 Degree Position" and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit", click "No".
- In the window "Available Functions:", select "5. Init Off & Store Positions" and click on "Execute".
- Close the status window by clicking on the OK button.
- For the query "Do you want to reset the unit", click "Yes".
- Return to the service program main menu with the ESC key.
- Select the Data, Backup... menu.
- Select Parameter in the Backup window.
- Click on "Backup".
- In "Remarks for Parameter", enter "camera rotation set“.

- Click "OK". The new position values for camera rotation will be stored to the disk.
- Switch the SIREMOBIL Compact OFF and ON again.
- Check the adjustments again. In the 0° position, the object image must correspond to the one in Fig. 4.

Calibrating the area dose product measurement device

NOTE	**This adjustment is used to calibrate the area dose product measurement device of the SIREMOBIL Compact display.**

Calculating the CONSTANT parameter (Qt * Kg)

- Read and record the Kg value shown on the electronics unit of the area dose product measurement device.
- Read the Qt value on the dose chamber of the area dose product measurement device.
- Multiply these values and record them. The resulting value is the CONSTANT (QT*Kg) value to be programmed.

Programming

- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Adjustment, Parameter menu.
- In the Combo box "Parameter Groups", select "Diamentor" .
- Click on "Get from Unit".
- The Parameter "1. Diamentor Existing" must be on YES .
- Select parameter "2. Constant (Qt * Kg)" .
- In "Value Actual:" field, enter the parameter you have calculated.
- Click on "Set Value".
- Click on "Put to Unit" .
- Click on "Save to File".

NOTE	**You must exit the service program with "Logoff" and "Quit" to store the modified parameters to disk as a new file.**

Checking the programmed values

NOTE

Checking the programmed values will activate the self-test in the electronic system of the area dose product measurement device. This serves to recalibrate the electronic system of the area dose measurement device.

Prerequisites

The Qt * Kg value was checked and is programmed. Refer to Programming.

- Connect the service PC to the serial interface on board D1.
- Start the service program.
- Select the Adjustment, Calibrations menu.
- Click "Yes" to answer the query.
- In the Combo box "Function Group:", select "Diamentor".
- In the window "Available Functions", select the line "Start Diamentor Test" and click on "Execute" .
- The tested Qt*Kg value is displayed on the monitor of the SIREMOBIL Compact.
- This value must match the programmed CONSTANT (Qt*Kg) value.
  Tolerance: +/- 5%.
- By pressing the -0- key (reset key for fluoroscopic time) the test is repeated and is displayed again on the monitor.
- The potentiometer CAL on the electronic system of the area dose product measurement device can be used to adjust the test value to the calculated and programmed Qt*Kg value.
- After the adjustment, select "Stop Diamentor Test" on the service PC and click on "Execute".
- The test is ended.
- Check the accuracy of the area dose product measurement device. Refer to the next page.

Checking the accuracy of the area dose product measurement device

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

Prerequisites

The calibration of the area dose product measurement device has already been performed.

Preparations

- Attach and center the center cross on the I.I. (Fig. 4).
- Select survey format.
- Select KV mA curve plateau HC1.

- Release fluoroscopy briefly, adjusting the iris on the radiation field to a format of approx. 15 cm.

NOTE

The radiation field must cover the entire area of the dose measurement chamber.

- Do not make any further adjustments to the iris.
- Record the average diameter (Fig. 7) of the octagonal area of the radiation field.
- Remove the center cross.
- Attach and center the small ($1cm^3$) dose measurement chamber of the dose measurement device onto the image intensifier (Fig. 5).
- Select kV STOP and enter 70 kV.

Dose measurement

- Press the >0< key twice to reset the area dose product on the Siremobil monitor to 0.
- Reset the dose measurement device to 0.
- Release fluoroscopy for approx. 5 seconds. The measured dose K_E should be high enough that the uppermost measurement range of the dose measurement device (Dali, Nomex...) is utilized fully. If necessary, reset the area dose product display on the Siremobil and the dose measurement device and repeat the measurement with a different fluoroscopic time.
- Record the measured dose.
- Record the area dose product displayed on the Siremobil monitor (FDPa).

Calculating the area dose product

- To calculate the measured area dose product:
  (measured area dose product FDPg) = (measured dose K_E) * (average diameter)^2 * 0.785

Evaluation

Calculate the deviation between the measured area dose product and the displayed area dose product:
The deviation must be < 0.3.

Deviation = [(displayed area dose product FDPa) - (measured area dose product FDPg)] / (measured area dose product FDPg)

For deviations > 0.3, the area dose product measurement device must be replaced.

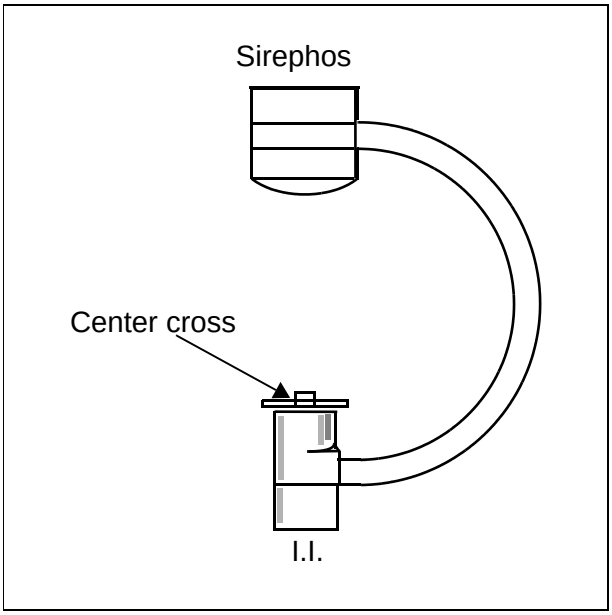

Fig. 6

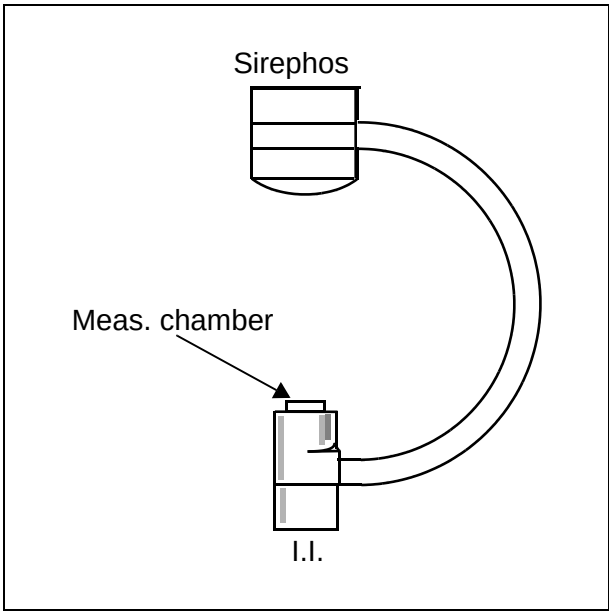

Fig. 7

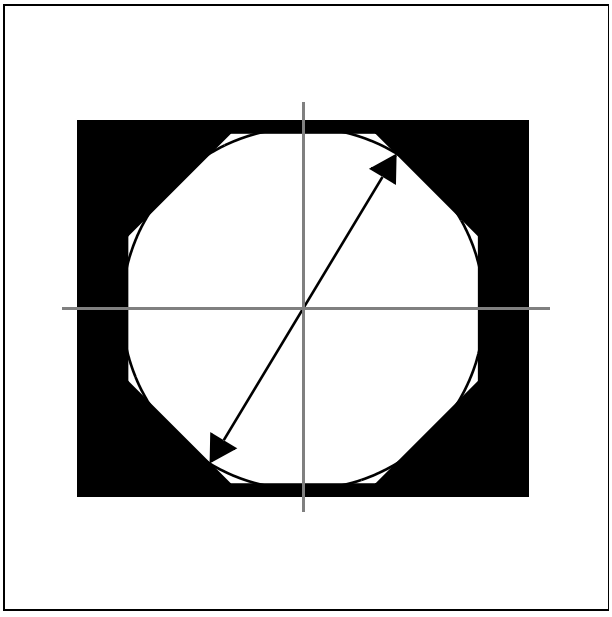

Fig. 8

Overview of SIREMOBIL Compact parameters

Invoke the Moreinfo.hlp help file on the service PC for a short description of the parameters available on the SIREMOBIL Compact.

NOTE

If parameters have been changed and saved in the "Adjustments, Parameter" menu with Save to file, you must exit the service program with "Logoff" and "Quit" to save the modified parameters to the disk.

Overview of Memoskop C / C-E parameters

User Setup

- The User Setup is invoked with the CTRL + U key combination.
- The available functions are described in the SIREMOBIL Compact Operating Instructions.

Technical Setup

- The technical setup is invoked with the CTRL + T key combination.

The following functions can be invoked:

Function:	Comments:
1. Test pattern generation	Not for service, invoke the necessary test images on the service PC.
2. Video frequency	The currently programmed frame rate is shown in the parentheses to the right. After downloading the Memoskop or after replacement, the Memoskop will start up at the default video frequency (50 Hz). If the monitors are configured for a different video frequency, you must perform "blind" configuration for the correct video frequency. Refer to Configuring video frequency.
3. Number of monitors	Allows you to program the number of monitors used (1 or 2) .
4. Hardcopy setup	You can configure the connection for hardcopy cameras. Check whether 5500 is programmed for "4 Max Hardcopy time" and if not, program this value.
5. Edge 1 coef set	Allows configuration of edge enhancement. Check whether 3 is programmed and if not, program this value.
6. Edge 2 coef set	Allows Configuration of edge enhancement. Check whether 8 is programmed and if not, program this value.
7. Motion detection setup	Configures the motion detector. Check if at MD 1: Threshold 100 and at MD 2: Threshold 120 is programmed, if not, program these values.
8. Circle mask setup	Allows you to configure the diameter of the circle mask.

Function:	Comments:
9. Move text positions	Allows you to configure the position of superimposed text.
10. Date / Time format	European: TT MM JJ / HH MM US: MM DD YY / HH MM
11. System configuration	Allows you to read out the current Memoskop configuration.
12. Keyboard	Allows you to program the corresponding keyboard layout Universal / Roman / English.
13. Language	Allows you to configure the language.
14. Graphics level	Level (brightness) of superimposed text. (Default: 128)
15. Display of real time clock	Yes: Real time clock (date and time) are displayed depending on the User setup programming for Memoskop. The real time clock is active. NO: The real time clock is switched off. The User setup programming will not affect it.
16. Display of rotated images	Yes: When pressing the image rotation key, the current image will be computerized and displayed. NO: The rotated image will not be computerized when pressing the image rotation key. For SIREMOBIL Compact always set to YES.
17. Monitor zoom	Yes: When pressing the key for Memoskop - Zoom, the image will be displayed enlarged. NO: The Memoskop - Zoom key has no function. For SIREMOBIL Compact set on NO.
18. Monitor split	Yes: Horizontal or vertical image split. No: No horizontal or vertical image split possible. For SIREMOBIL Compact with 1 monitor: program Yes. For SIREMOBIL Compact with 2 monitors: program No.
19. Monitor text	Yes: Superimposes text. No: No text superimposition. For SIREMOBIL Compact always set on Yes.
20. Maximum image numbers	The number of stored images can be programmed. Program the value to 700 for Memoskop C.
21. Product name	Allows you to change the Memoskop name, displayed during system booting. Do not change this for SIREMOBIL Compact !
22. Diagnostics	Allows you to invoke test routines for repair by the manufacturer of the Memoskop.

Configuring Memoskop

Memoskop C-E, keyboard emulation

If no keyboard is included with the present SIREMOBIL Compact with Memoskop C-E, although a keyboard is required when replacing the Memoskop C-E or when changing the configuration.

In these cases, the keyboard must be emulated with the assistance of the service PC and the "TERMINAL.EXE" program. Always use the adapter supplied which is installed on the keyboard output of the Memoskop C-E. Leave the adapter (item number 31 00 380 G5437) attached to the system.

When replacing the Memoskop C-E, remove the adapter from the Memoskop and attach it to the new unit.

The Installation / Startup Information MEMOSKOP C-E Keyboard Emulation,
SIREMOBIL Compact up to Serial No. 01416,
Print No. SPR2-130.038.01 and the required
program "Keyboard emulation program terminal.exe"
can be found in the CS Intranet, path:

For Service - SP - SURGERY - SIREMOBIL Compact - CB-DOC - Service - Memoskop.

Configuring the video frequency

After replacing the Memoskop, it will start at a default video frequency (50 Hz). If the monitors were configured for a different frequency, you will have to configure the correct video frequency without a "visible image".

Proceed with the steps described below:

- Invoke Technical Setup on Memoskop (press the CTRL + T keys.)
- Press the "2" key and press return. The video frequency menu is selected.
- Depending on the required video frequency, press the right cursor key "->".

„->“ pressed 1 time: 60 Hz video frequency
„->“ pressed 2 times: 100 Hz video frequency
„->“ pressed 3 times: 120 Hz video frequency
„->“ pressed 4 times: 50 Hz video frequency.

"<-" = Press the left cursor key.

"->" = Press the right cursor key

Key "->":	(Start)	"->"	"->"	"->"	"->"	...
Video frequency	50 Hz	60 Hz	100 Hz	120 Hz	50 Hz	etc...
Key "<-":	"<-"	"<-"	"<-"	"<-"	"<-"	"<-"

After selecting the desired video frequency, press "Return".
This configures the video frequency you have just selected.
After switching the SIREMOBIL OFF and ON again, the Memoskop C-E will start up at the correct video frequency.

Memoskop, configuration for the number of existing monitors

When you replace the Memoskop, it will be configured for 2 monitors. This configuration displays USER SETUP and TECHNICAL SETUP on the second monitor. Therefore, USER SETUP and TECHNICAL SETUP are not visible for SIREMOBIL Compact systems with only one monitor. To reconfigure the system to 1 monitor, proceed as follows:

- Switch the SIREMOBIL Compact on.
- On the Memoskop, reconnect the video cable from OUT 1 to OUT 2.
- Press CTRL + T at the same time on the Memoskop keyboard;
  TECHNICAL SETUP is called up and is now visible on the monitor.
- Call up the menu "Number of monitors" by pressing the "3" key and subsequently the "RETURN" key on the Memoskop keyboard.
- With the -> and <- cursor keys, set the number to 1 monitor and press the "RETURN" key.
  The text display disappears on the monitor.
- Press the "RETURN" key once more.
- Reconnect the monitor to the OUT 1 video output.
  The text display is now visible on the monitor.
- Exit TECHNICAL SETUP by pressing the "HOME" key on the Memoskop keyboard.

Control board D1

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Make sure that LED V400 on board D2 is off prior to performing any work on boards D1 and D2. This should occur approximately 3 minutes after switching the SIREMOBIL Compact OFF.

- Disconnect board D1 completely.
- Replace board D1.
- Reconnect all cable connections.
- Be sure that the shielding and ground connections are seated correctly.
- Set the jumpers and switches according to the circuit diagram.
- Perform the download procedure for control board D1 (Host/Arc/Fil.).
- After the download, wait for 1 minute until the system has rebooted.
- Load the system parameters onto board D1.
  (Select DATA menu, RESTORE Parameter and click Restore.)
- Perform the kV offset adjustment.
- Perform the generator adjustment (filament circuit learning program).
- Check the dose rate control and adjust it if necessary.
- Ensure that the camera rotation is functioning properly. Adjust if necessary.
- Ensure that the collimator is functioning properly. Adjust if necessary.
- Ensure that the area dose product measurement device (where present) is functioning correctly.
- Ensure that the laser targeting device (where present) is functioning properly.
- Test the FL / PFL / DR and direct exposure functions of the SIREMOBIL Compact.

Power supply board D2

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Make sure that LED V400 is off prior to performing any work on boards D1 and D2. This should occur approximately 3 minutes after switching the SIREMOBIL Compact OFF.

- Disconnect boards D1 and D2 completely.
- Disconnect the cables between boards D1 and D2.
- Remove board D1 and D2.
- Apply heat conducting paste to the heat sink for the power semiconductor on the new D2 board.
- Reinstall board D2 and D1 and reattach all connections.

- Ensure that the shielding and ground connections are positioned correctly.
- Perform the kV offset adjustment and the generator adjustment (filament learning).
- Test the FL / PFL / DR and direct exposure functions (if there is a cassette holder).

Interface board D3

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Switch the system power supply off and disconnect the power plug.

- Replace interface board D3.
- Check the +26.75 V voltage for the I.I. mini voltage supply. Adjust it if necessary. Refer to Chapter 3 of these instructions and check the operating voltages.
- Check the radiation release / format switch over / vertical column travel functions.

Videomed DC

- Set the camera rotation to the 0° position and mark the position of the Videomed DC relative to the rotating I.I. optics.
- Switch the system OFF and wait approximately 3 minutes for the anode voltage of the I.I. mini voltage supply to drop.
- Disconnect the I.I. anode cable from the I.I. mini voltage supply.
- Make sure to short out the residual charge to ground.
- Ensure the correct high tension cable lengths by marking the position of the mounting cap nut on the anode cable with a colored pencil or electrical tape.
- Remove the O-ring and the cap nut from the anode cable.
- Disconnect the cable from the Videomed DC and the Compact optics.
- Cut the cable ties securing the cable.
- Replace the Videomed DC. Ensure that the Videomed DC is at the 0° position relative to the rotating I.I. optics.
- Reconnect the Videomed DC - Compact optic cable and secure it with cable ties.
  Make sure that the cable does not protrude past the edge of the board. It must lie in the recess of the Videomed DC board.
- Reroute the anode cable to the I.I. mini voltage supply.
- Reinstall the cap nut (as marked).
- Reinstall the O-ring.
- The distance from the cap nut to the beginning of the white insulation of the anode cable should be 70mm.
- Reconnect the anode cable and secure it.
- Check the camera rotation and adjust it if necessary.
  The camera should rotate + 220° ± 3° or − 220° ± 3° (check this using the display).

- Check the dose rate and adjust it if necessary.
- Check the image sharpness with the IQ Quick test and, if necessary, adjust it at the I.I. optics.
- Perform the IQ Quick test.

Power supply M14, +5V / +15V / -15V

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Switch the system power supply off and disconnect the power plug.

- Replace the power supply.
- Check the power supply voltage and adjust it if necessary. Refer to Chapter 3 of these instructions and check the operating voltages.

Power supply M13, +12.3V Videomed DC

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Switch the system power supply off and disconnect the power plug.

- Replace the power supply.
- Check the power supply voltage and adjust it if necessary. Refer to Chapter 3 of these instructions and check the operating voltages.

I.I. mini voltage supply

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Prior to removing the mini voltage supply, the system must be switched off for at least 3 minutes until the high voltage in the system and in the I.I. mini voltage supply dissipates.

- Replace the control panel of the I.I. mini voltage supply (installed above Videomed DC.).
- Replace the high voltage panel of the I.I. mini voltage supply (Mounted on the C-arm, accessible after removing the cover near the I.I., on the outer edge of the C-arm. Refer to Chapter 1, "Information regarding this document").
- Refer to the I.I. test protocol for the voltages E1 / E2 / E3 and A. Check and adjust them, if necessary, according to Chapter 3, "Checking the operating voltages".
- Check the collimation for survey and zoom formats and adjust it if necessary.
- Check the overall resolution according to the IQ Quick test.
- Perform the IQ Quick test.

Collimator

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.
Protect yourself against radiation exposure. Wear a lead apron.

- Replace the collimator.
- Ensure that the collimator is functioning properly and is set correctly.
  Adjust it if necessary.

- Ensure that the collimator blades of the iris diaphragm are visible during fluoroscopy in survey format and zoom format on at least two sides of the monitor image.
- Check the collimation for direct exposure if a cassette holder is being used.
- Remove the old set of collimator labels near the Sirephos and attach the new labels included in the same position.
  Check that the original collimator labels are the same as the new ones.

Sirephos

- Remove the laser targeting device, if present.
- Remove the dose measurement chamber, if present.
- Remove the collimator.
- Disconnect the Sirephos plug.
- Remove the ground screw for the protective conductor.
- Remove the rubber stop of the C-arm on the Sirephos side. The screws that secure the Sirephos are now visible.
- Remove the Sirephos screws. When doing this, have a second person hold the X-ray tube unit.
- Place the new X-ray tube unit on the guide bolts and secure it with both Allen screws.
- Ensure that all cables are routed properly.
- Reconnect the Sirephos plug and secure it.
- Reconnect the protective conductor using the ground screw.
- Do not install the rubber stop yet.
- Reinstall the collimator and connect it.
- Reinstall the dose measurement chamber / laser targeting device and connect them.

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.
Protect yourself against radiation exposure. Wear a lead apron.

- Perform the kV offset adjustment.
- Perform the generator adjustment (filament circuit learning program).
- Ensure that the collimator is functioning properly and is set correctly.

- Ensure that the collimator blades are centered in the blanking circle. If possible, slightly loosen the Sirephos screws and tilt the Sirephos to adjust it. Retighten the Sirephos screws.
- Ensure that the collimator blades of the iris diaphragm are visible during fluoroscopy in the survey format and zoom format on at least two sides of the monitor image.
- Check the collimator display on the monitor screen.
- Check collimation for direct exposure if there is a cassette holder.
- Reinstall the rubber stop.
- Ensure that the area/dose product measurement device is functioning properly (if present).

- Check the dose rate settings and adjust them, if necessary.
- Check the settings of the maximum skin dose rate.
- Check the setting of the laser targeting device and, if necessary, adjust it according to the Adjustment Instructions for the Laser Targeting Device,RXR2-130.032.01.
- Re-attach the SIREPHOS cover.
- Seal the SIREPHOS cover using sealing compound. See Chapter 1 "Covers".

Replacing the I.I.

Checking the temperature indicator

- Prior to installing the I.I., check the temperature indicator:
  - ➪ If the inner square field of the indicator is white, the I.I. did not exceed the temperature range. Remove the temperature indicator.
  - ➪ If the indicator is discolored (inner field is black), proceed according to the IQ document RXD-000.038.01.

Removing the old I.I

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Prior to removing the mini voltage supply, the system must be switched off for at least 3 minutes until the high voltage in the system and in the I.I. mini voltage supply dissipates.

- Turn the C-arm so that the I.I. is on top.
- Loosen the I.I. cover and remove it.
- Rotate the camera to the zero position (6/Fig. 2).
- Remove the cover adjacent to the I.I. above the high voltage section on the outer side of the C-arm.
- Remove the high voltage section and disconnect all cables.
- Dissipate any residual voltage in the cables by shorting them to ground.

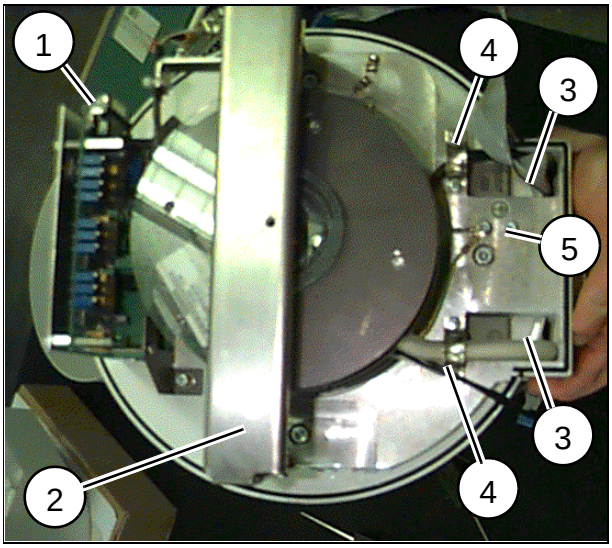

Fig. 1

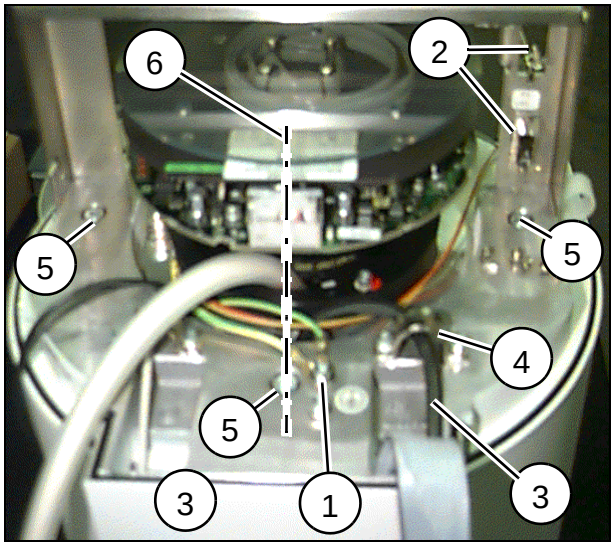

Fig. 2

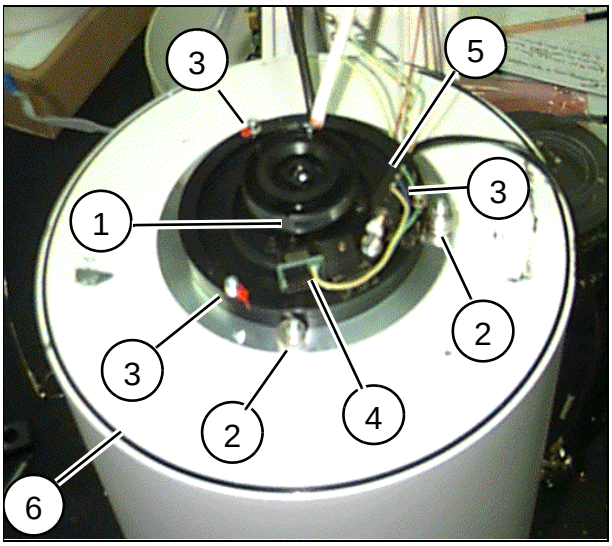

Fig. 3

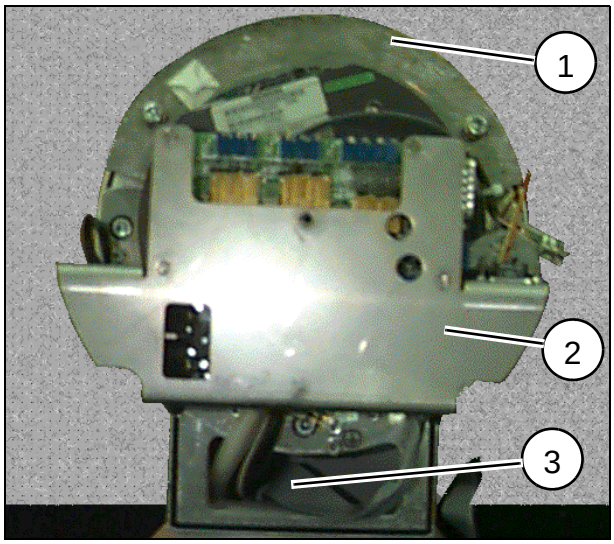

Fig. 4

- Remove the counterbalancing weight on the 7”/17cm I.I. (1/Fig. 4).
- Remove the plug from the control section on the I.I. mini voltage supply (1/Fig. 1/2).
- Disconnect the protective conductor connections and the grounding screw (5/Fig. 1).
- Remove plug D4.X1 of the Videomed DC (2/Fig. 2).
- Secure the end of the cable which you have wound up on the cable reel of the Videomed DC with adhesive tape.
- Remove the cable between the Videomed DC and the Compact optics and cut the cable ties securing it.
- Remove plug X45 of the cassette contact. (2/Fig. 2).
- Remove both jacks D4.X1 and X45 from the receptacle (2/Fig. 2).

- Pull the "Anode, E3 and Penning" cables leading from the high voltage section to the I.I. out of the C-arm. (3/Fig. 2).
- Loosen the retainer clip above the camera and remove it (2/Fig. 1 or 2/Fig. 4).
- Remove the control panel of the I.I. mini voltage supply from the 9”/23cm I.I.
- Loosen the camera set screw slightly and remove the camera (1/Fig. 3).

NOTE

Do not loosen the eccentric screws (Fig. 3/2) on the edge of the Compact optics! These are used to center the Compact optics to the I.I. output screen. When removing the Compact optics, make sure that no dust or dirt contaminates the I.I. output window or the Compact optics.

- Loosen the Compact optics (3/Fig. 3).
- Remove the retaining clips on the cables (4/Fig. 1).
- Remove the O-ring and the cap nut from the anode cable.
- Disconnect plug M30.X1 (4/Fig. 3).
- Remove the Compact optics.
- To do this, pull the anode cable out of the Compact optics recess.
- Rotate the C-arm so that the I.I. is underneath and the tube assembly above.

⚠CAUTION

Risk of crushing!
Noncompliance may cause damage to property.

Apply all C-arm brakes and hold the I.I. when removing the attachment screws.

- Remove the attachment screws from the I.I. mounting. When doing this, hold onto the I.I. (5/Fig. 2).
- Remove the I.I. from the mounting.

Installing the new I.I.

NOTE

When installing the Compact optics and the Videomed DC, make sure that no dust or dirt contaminates the I.I. output window or the Compact optics.

- Prior to installing the new I.I. on the C-arm mounting, complete the following work:
- Reinstall the Compact optics on the new I.I.
  - When doing this, feed the anode cable through the recess in the optics. The Compact optics must sit adjacent to the eccentric screws.
- Move the camera rotation of the Compact optics to the zero position.
  - To do this, connect the ohmmeter to the potentiometer for camera rotation, position 2 and 3 (5/Fig. 3).
    A resistance value of 5000 ohms, ±40 ohms must be measured for the center position.
  - Hold the camera rotation by the clamp ring (1/Fig. 3) and turn it to the correct position, if necessary.

- Place the Videomed DC in the zero position on the Compact optics (6/Fig. 2) and clamp it in place.
- Connect the cable from the Videomed DC to the Compact optics and secure it with cable ties.
  Make sure that the cable does not protrude past the edge of the board and that it lies in the recess of the Videomed DC board.
- Install the new control section included in the I.I. delivery volume.
- Connect cables E1, E2.
- Secure the new I.I. to the mounting with the screw.
  - The I.I. can be swivelled slightly to the side to permit easier cable routing.
- Route the cables for the high voltage section back through the recess in the I.I. (3/Fig. 1 or 3 Fig. 4).
- Swivel the I.I. back again.
  - When doing this, make sure that all the cables are correctly positioned.
- Secure the I.I. on the mounting (5/Fig. 2).
- The C-arm can now be rotated to permit easier installation of components (I.I. above, tube assembly underneath).
- Reinstall the O-ring and the cap nut on the anode cable.
  - The cable length from the beginning of the white wire to the cap nut should be 70 mm.
- Reinstall the high voltage section in the C-arm.
  - Reconnect all the cables.
- Reinstall the hand rail above the Videomed DC.
- Reinstall both jacks D4.X1 for the Videomed DC and X45 for the cassette contact on the receptacle.
- Reconnect the D4.X1 plug for the Videomed DC and the X45 plug for the cassette contact.
- Reconnect plug M30.X1.
- Reconnect plug D120.X1 to the control section of the I.I. mini power supply.
- Reconnect the protective conductor to the ground screw (5/Fig. 1).
- Reinstall the cable clips (4/Fig. 1).
- Reinstall the counterbalance weight for the 7”/17cm I.I
- Check the existence of the sealing ring 6 /Fig. 3.

NOTE	**Check the presence of the sealing ring 6/Fig. 3 at the new I.I. If none is present, remove the sealing ring from the old I.I. (glued to the I.I. housing with 4 to 6 dots), lay it in the groove of the new I.I. housing and fix it with 4 to 6 dots of adhesive (e.g. superglue).**

Checks and adjustments

- Check the I.I. electrode voltages according to the test protocol for the I.I.
  - Do **not** readjust in cases where there are only slight deviations from the values on the test protocol (measurement device tolerances).
- Check that the camera optics are centered to the I.I. output and adjust them if necessary; refer to "Replacing the camera optics ", subitem "Checking the centering of the camera optics to the I.I. output " and "Centering the camera optics to the I.I. output".
- Check the camera rotation and readjust it if necessary.
- Check the setting of the radiation iris and readjust it if necessary.
- Check the dose rate and readjust it if necessary.
- Perform the IQ Quick test.
  - When doing this, check the resolution first and, if necessary, readjust the optical resolution of the Compact optics.
- Complete the country-specific acceptance. (§16 Partial acceptance... /DHHS...)

Replacing the compact optics

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Prior to removing the mini voltage supply, the system must be switched off for at least 3 minutes until the high voltage in the system and in the I.I. mini voltage supply dissipates.

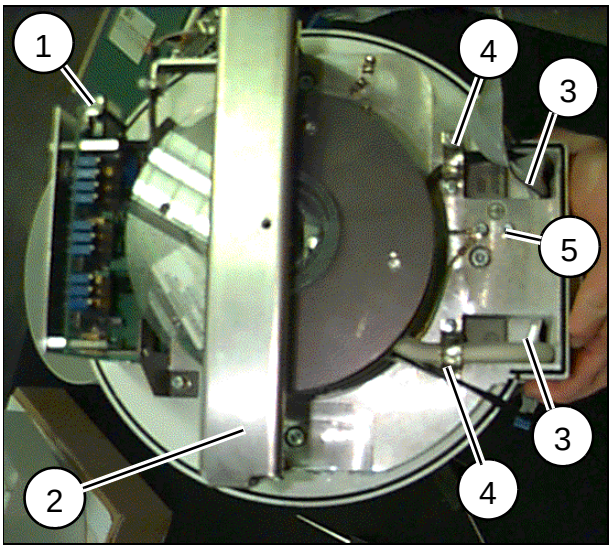

Fig. 5

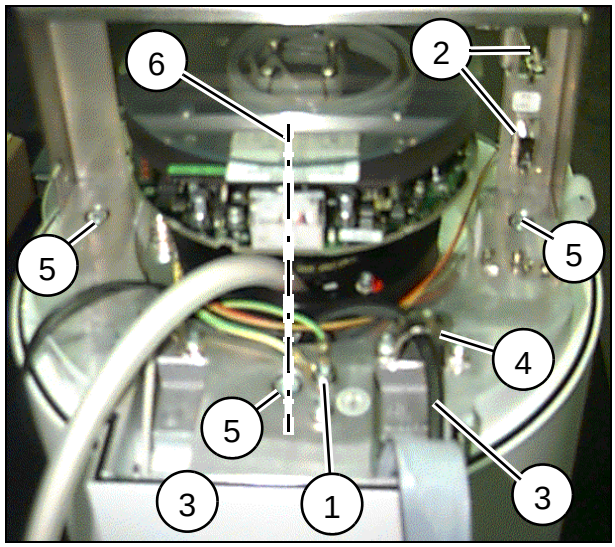

Fig. 6

Removing the Compact optics

- Turn the C-arm so that the I.I. is at the top.
- Loosen and remove the I.I. cover.
- Rotate the camera in the "0" position (6/Fig. 6).

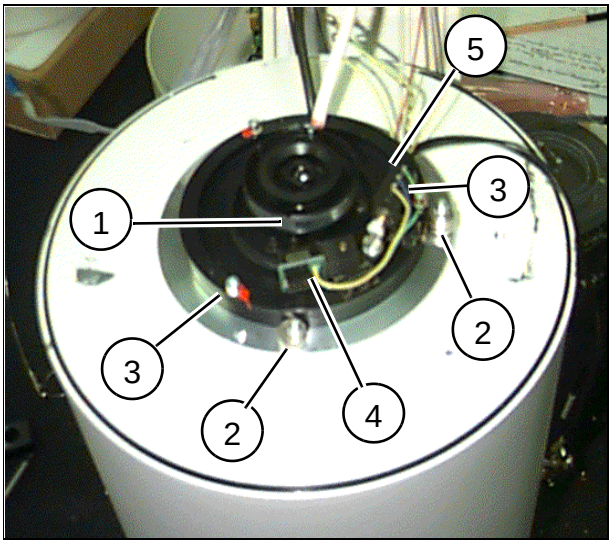

Fig. 7

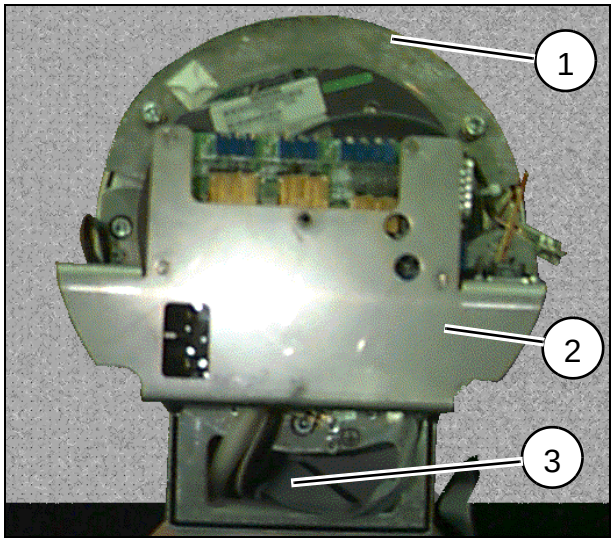

Fig. 8

- Remove the cover over the high voltage panel (C-arm away from you, I.I. near you).
- Remove the high voltage panel from the C-arm and remove the anode cable.
- Short out the residual charge to ground.
- Remove the O-ring and the cap nut from the anode cable.
- Withdraw the anode cable upward from the C-arm.
- Place the high voltage panel back in the C-arm for now.
- Disconnect the plugs of the control panel of the I.I. mini voltage supply (1/Fig. 5).
- Disconnect the protective conductor connections and the ground screw (5/Fig. 5).
- Remove plug D4.X1 of the Videomed DC (2/Fig. 6).
- Secure the cable rolled-up in the cable spool of the Videomed DC with adhesive tape.
- Remove plug X45 of the cassette contact (2/Fig. 6).
- Remove jacks D4.X1 and X45 from the clips (2/Fig. 6).
- Loosen the retainer clip above the camera and remove it (2/Fig. 5 or 2/Fig. 8).
- Remove the control panel from the 9"/23cm I.I.
- Disconnect the plug from the Videomed DC and the Compact optics.
- Cut off the cable ties.
- Loosen the camera set screw slightly and remove the camera (1/Fig. 7).

NOTE

Do not loosen the eccentric screws 2/Fig. 7 on the edge of the Compact optics. These are used to center the Compact optics to the I.I. output. When removing the Compact optics, make sure that no dust or dirt contaminates the I.I. output window or the Compact optics.

- Disconnect plug M30.X1 (4/Fig. 7).

- Loosen and remove the Compact optics (3/Fig. 7).
- Remove the rubber gasket.
- Remove the anode cable from the recess in the Compact optics.

Mounting the Compact optics

NOTE	**When installing the Compact optics and the Videomed DC, make sure that no dust or dirt contaminates the I.I. output window or the Compact optics.**

- Reinsert the rubber gasket between the I.I. output and the camera optics. Reattach the Compact optics to the new I.I.
  Insert the anode cable through the opening in the optics.
  The Compact optics must lie against the excenter screws.
- Adjust the camera rotation of the Compact optics to the "0" position (6/Fig. 6).
- To do this, connect an ohm meter to the potentiometer for camera rotation, location 2 and 3 (5/Fig. 7).
  The resistance must measure 5000 ohms +/- 40 ohms in the middle position.
- If necessary, adjust the camera with the clamping ring (1/Fig. 7) by rotating it to the correct position.
- Install the Videomed DC in the "0" position on the Compact optics and secure it (6/Fig. 6).
- Connect the Videomed DC - Compact optics cable and secure it with cable ties.
  Make sure that the cable does not protrude past the edge of the board and that it lies in the recess of the Videomed DC board.
- Insert the anode cables for the high voltage panel back into the C-arm (3/Fig. 5).
- Reinstall the O-ring and the cap nut on the anode cable.
  The cable length should be 70 mm from the beginning of the white wire to the cap nut.
- Reinstall the high voltage panel in the C-arm and reconnect all the cables.
- Mount the retainer clip above the Videomed DC.
- Reconnect both jacks, D4.X1 for the Videomed DC and X45 for the cassette contact to the retainer clip.
- Connect plugs D4.X1 for the Videomed DC and X45 for the cassette contact.
- Connect plug M30.X1.
- Connect plug D120.X1 to the control panel of the I.I. mini voltage supply.
- Reconnect the protective conductor with the ground screw (5/Fig. 5).
- Reinstall the cable clamps (3/Fig. 6).
- Attach 2.1 mm Cu and 60 mm Al prefiltration to the radiation port of the Sirephos.
- Attach the resolution test to the I.I. input screen and check the optical resolution. Readjust it if necessary.
- Remove the resolution test from the I.I. input screen.
- Check the dose rate and readjust it if necessary.

Checking the camera optics centering at the I.I. output

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

- Mark the center of the I.I. input as precisely as possible using a small washer and adhesive tape.
  If there is a laser light localizer, the I.I. attachment with the lead cross can also be used.
- Select the survey format.
- Move the camera into the 0° position.
- Switch fluoro on briefly.
- Mark the center of the washer or lead cross on the monitor (see Fig. 9).
- Rotate the camera in the -220° position.
- Mark the center again on the monitor (see Fig. 9).
- Rotate the camera in the in +220° position.
- Mark the center again on the monitor (see Fig. 9)
- Place an 8 mm washer over the three markings.
  All three markings must be located within the 8 mm diameter of the washer. An 8 mm washer has a somewhat larger inner diameter of 8.4mm, therefore the markings must clearly lie within the inner diameter and should not touch the edge of the washer.
- If the diameter is <= 8mm, the following centering adjustment does not have to be performed.
  Continue with "checks and adjustments".
- If the markings exceed > 8mm, proceed as follows :

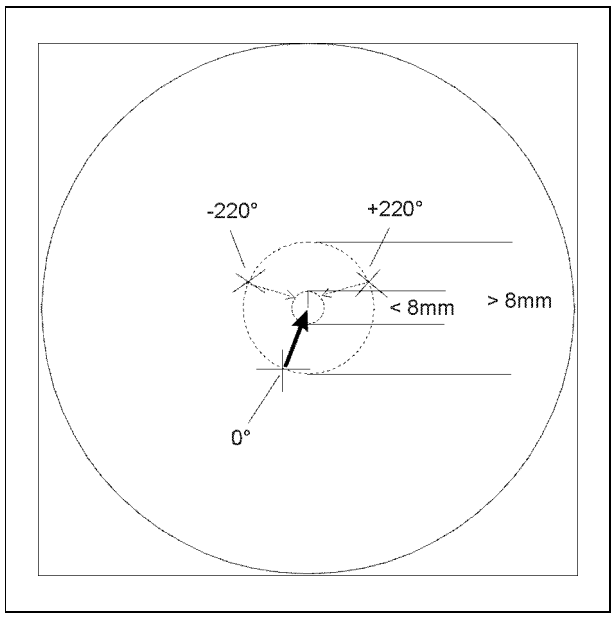

Fig. 9

Centering the camera optics to the I.I. output

⚠WARNING

X-ray radiation!
See Chapter 1, Safety Information.

Protect yourself against radiation exposure. Wear a lead apron.

Prerequisite: The +220°, -220° and 0° positions were already marked as previously described.

- Rotate the camera optics back to the 0° position.
- Loosen the three attachment screws of the camera optics slightly.
- Loosen both excenter screws adjacent to the camera optics slightly.
- Move the camera optics toward the center, between both +220° and -220° markings (see also Fig. 9).

- Switch fluoro on briefly and evaluate the position on the monitor.
  According to the ratio of the I.I. input screen diameter to the I.I. output screen diameter, a shift of the camera optics by approximately 0.1 mm corresponds to a position shift of the washer displayed on the monitor of more than 1.3 mm (17 cm I.I.) or 1.7 mm (23 cm I.I.).
- Secure the camera optics again.
- Erase the three markings on the monitor.

- Switch fluoro on briefly and mark the new 0° position.
- Rotate the camera to the -220° position.
- Mark the center on the monitor.
- Rotate the camera to the + 220° position.
- Mark the center on the monitor.
- Place an 8 mm washer over the three markings.
  All three markings must be located within the 8 mm diameter of the washer. An 8 mm washer has a somewhat larger inner diameter of 8.4 mm, therefore the markings must clearly lie within the inner diameter and should not touch the edge of the washer. If necessary, repeat the adjustment until the three markings fall within the 8 mm diameter.
- Secure the camera optics.
- Retighten the excenter screws of the camera optics.

Checks and adjustments

- Check the camera rotation and adjust it if necessary.
- Check the setting of the radiation iris and readjust it if necessary.
- Check the dose rate again and adjust it if necessary.
- Perform the IQ quick test.

Memoskop C-E

NOTE

Read and record the parameters for Memoskop C-E if you are able to select User setup. After replacing the Memoskop, configure the Memoskop C-E according to the parameters noted.

- Replace the Memoskop C-E.
  The attachment screws are on the underside of the storage device.
- Configure the Memoskop C-E for the correct video frequency and the number of monitors present.
  Refer to Chapter 5 "Memoskop C-E without Keyboard, Emulation ...", "Configuring the Video frequency" and "MEMOSKOP-Configuration for the number of existing monitors".
- Configure the following parameters in Technical Setup for the Memoskop:

3 Number of monitors	Configure 1 for SIREMOBIL Compact with1 monitor. Configure 2 for SIREMOBIL Compact with 2 monitors.
4 Hardcopy setup	Check whether 5500 is programmed in "4 Max Hardcopy time". If not, program this value.
5 Edge 1 coef set	Check whether 3 is programmed, if not, program this value.
6 Edge 2 coef set	Check whether 8 is programmed, If not, program this value.
7 Motion detection setup	Check whether the following are programmed MD1: Threshold 100 and at MD2: Threshold 120. If not, program these values.
10 Date / Time format	Set to country-specific format.
12 Keyboard	Set to the keyboard layout being used.
13 Language	Set for the language of the country.
15 Display of realtime clock	Configure Yes. Configure No only upon customer request.
16 Display of rotated images	Configure Yes.
17 Monitor zoom	Configure No.
18 Monitor split	Configure Yes for SIREMOBIL Compact with 1 monitor. Configure No for SIREMOBIL Compact with 2 monitors.
19 Monitor text	Configure Yes.
20 Maximum image number	Configure 100.

- Configure the following parameters in User setup for Memoskop:

A Operating mode parameters	Change the programmed parameters only on the customer's request.
B Video recorder output	Configure to Monitor A.
C Documentation	For SIREMOBIL Compact with 1 monitor: Configure to monitor A. For SIREMOBIL Compact with 2 monitors: Configure to monitor B.
D Text monitor	For SIREMOBIL Compact with 1 monitor: Configure to monitor A. For SIREMOBIL Compact with 2 monitors: Configure to both monitors.

E Monitor split	Configure horizontally. Configure vertically only upon customer request.
F Time	Configure Yes.
G Date / Time setting	Set the current date and time.
H Hospital name	Program the hospital name.
I Storing the dose	If the area dose product meter is present, (Diamentor) configure Yes. Otherwise, configure No.
K Dose documentation	If the area dose product meter is present, (Diamentor) configure Yes. Otherwise configure No.

- Perform the IQ quick test.

Memoskop C

NOTE

Read and record the parameters for Memoskop C if you can select User setup. After replacing the Memoskop, configure the Memoskop C-E according to the parameters noted.

- Replace the Memoskop C.
  The attachment screws are accessible on the underside of the storage device.
- Set the Memoskop C to the correct video frequency and configure it for the number of existing monitors.
  Refer to Chapter 5 "Configuring the video frequency " and "MEMOSKOP - Configuration for the number of existing monitors".
- Configure the following parameters in Technical Setup for Memoskop:

3 Number of monitors	Configure 1 for SIREMOBIL Compact with 1 monitor. Configure 2 for SIREMOBIL Compact with 2 monitors.
4 Hardcopy setup	Check whether 5500 is programmed in "4 Max Hardcopy time". If not, program this value.
5 Edge 1 coef set	Check whether 3 is programmed, If not, program this value.
6 Edge 2 coef set	Check whether 8 is programmed, If not, program this value.
7 Motion detection setup	Check whether the following are programmed "MD1: Threshold" 100 and for "MD2: Threshold" 120. If not, program these values.
10 Date / Time format	Set the country-specific format.
12 Keyboard	Set to the keyboard layout being used.
13 Language	Set for language of the country.
15 Display of realtime clock	Configure Yes. Select No only upon customer request.
16 Display of rotated images	Configure Yes.
17 Monitor zoom	Configure No.
18 Monitor split	Configure Yes for SIREMOBIL Compact with 1 monitor. Configure No for SIREMOBIL Compact with 2 monitors.
19 Monitor text	Configure Yes.
20 Maximum image number	Configure 100.

- Configure the following parameters in User setup for Memoskop:

A Operating mode parameters	Change the programmed parameters only upon the customer's request.
B Video recorder output	Configure to monitor A.
C Documentation	For SIREMOBIL Compact with 1 monitor: configure to monitor A. For SIREMOBIL Compact with 2 monitors: Configure to monitor B.
D Text monitor	For SIREMOBIL Compact with 1 monitor: configure to monitor A. For SIREMOBIL Compact with 2 monitors: configure to both monitors.
E Monitor split	Configure horizontally. Configure vertically only upon customer request.
F Time	Configure Yes.
G Date / Time set	Set the current date and time.
H Hospital name	Program the hospital.
I Dose storage	If area dose product meter is present, (Diamentor) configure Yes. Otherwise configure No.
K Dose documentation	If area dose product meter is present, (Diamentor) configure yes. Otherwise configure No.

- Perform the IQ quick test.

Multispot 2000

⚠WARNING

Electrical voltage!
See Chapter 1, Safety Information.

Switch the system power supply off and disconnect the power plug.

Before installing the new Multispot 2000, set the correct refresh rate.
Refer to Table 1.

50Hz refresh rate		60Hz refresh rate	
Jumper	Position	Jumper	Position
X4	b	X4	a
X5	open	X5	open
X6	b	X6	a
X7	b	X7	a
X8	b	X8	a
X9	b	X9	a
X10	b	X10	a
X11	b	X11	a

Tab. 1

- Disconnect the SIREMOBIL Compact line voltage plug from the receptacle.
- Replace the Multispot 2000.
- The screws securing the Multispot 2000 are accessible on the underside of the camera.
- Perform a camera function test after the replacement.
- Generate and program the exposure parameters for the Multispot 2000 according to the IQ Quick test (refer to the log book). Record the new exposure parameters in the IQ Quick test instructions.

Area dose product measurement device

- Remove the SIREPHOS cover (see Chapter 1, "Covers").
- Replace the electronics board and the dose measurement chamber.
- Perform the calibration of the area/dose product measurement device. Refer to Chapter 5 "Calibrating the Area Dose Product Measurement".
- Test the accuracy of the area dose product measurement device. Refer to Chapter 5 "Testing the accuracy of the area dose product measurement device.
- Re-attach the SIREPHOS cover.
- Seal the SIREPHOS cover using sealing compound (see Chapter 1, "Covers").

Laser targeting device

- Remove the SIREPHOS cover (see Chapter 1, "Covers").
- Replace the laser diodes after removing the plastic bracket and desoldering the wires.
- Adjust the laser diodes using the adjustment device supplied with the laser targeting device.
- Re-attach the SIREPHOS cover.
- Seal the SIREPHOS cover using sealing compound (see Chapter 1, "Covers").

Brake forces

⚠WARNING

Risk of physical injury and damage to property!

When performing service work on the horizontal slide of the basic unit (for example when performing repair work on the brake of the C-arm horizontal travel) it is possible that the C-arm may slide out of its position and drop onto the floor after the end stop has been removed.
Before dismantling the end stop, the horizontal travel brake must be locked and the horizontal slide must be mechanically locked in order to prevent it from sliding out. For example, the basic unit can be positioned in the room in such a way that the C-arm mechanically touches one of the walls.

See also page 1- 8 "Back stop plate at the C-arm horizontal support"

- Position prerequisites for measuring the forces: angulation, orbital, and horizontal swivel movements must be at zero on the scale and horizontal movement should be at 20 on the scale.
- All measurements should be made with a spring measure on the railing near the image intensifier with the DHHS spacer, if present, installed on the X-ray tube.

Movement	Nominal values		Comments
	Brake released:	Brake applied:	
Horizontal travel	$\geq$ 20 N / $\leq$ 35 N	$\geq$ 160 N	n.a.
Angulation	$\leq$ 17 Nm	$\geq$ 40 Nm	n.a.
Orbital movement	$\geq$10 N / $\leq$ 24 N	$\geq$ 65 N	measure with the C-arm in vertical position.
Horizontal swivel	$\leq$ 10 Nm	$\geq$ 90 Nm	n.a.

Lubricating the vertical column

- The spindle in the vertical column should be lubricated during annual maintenance.
- Raise the vertical column approximately 50 cm. A drilled hole is visible in the column.
- Fill this hole with approximately 2 cm^3 of oil.
- Oil to be used:
  Special purpose oil (Optimol GmbH; Viscogen KL300; 40g),
  Item number 73 95 353 RH090.

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⚠WARNING	**X-ray radiation!** **See Chapter 1, Safety Information.** **Protect yourself against radiation exposure. Wear a lead apron.**

NOTE	**When measuring the tube current, the distribution current must be derived from the measured value. The distribution current depends upon the kV and is calculated according to Ohm's law. The distribution resistance is 400MOhm.**

- Switch OFF SIREMOBIL Compact.
- Remove jumper X97 from board D1.
- Connect the mA measuring device at D1.X39 and D1.X40.
- Switch ON SIREMOBIL Compact.

- Release radiation and read the overall current.
- Read out the kV value produced while the current is being measured.

Calculate the tube current as follows:

$$\text{tube current [mA]} = \text{overall current [mA]} - \frac{\text{high voltage [kV]}}{\text{distribution resistance [MOhm]}}$$

e.g.:

At 110kV, an overall current of 5.275 mA is measured.

$$\text{tube current [mA]} = 5.275\ \text{[mA]} - \frac{110\ \text{[kV]}}{400\ \text{[MOhm]}} = 5.275\ \text{[mA]} - 0.275\ \text{[mA]} = \underline{5.0\ \text{[mA]}}$$

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Chapter 0	Cover page, revision level, table of contents revised
Chapter 1 to Chapter 8	Safety Information revised and added. Radiation safety labels changed to the actual label Revision level revised

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